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Measles Outbreaks in Religious Groups Exempt from Immunization Laws

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Synopsis

State immunization laws which exempt religious groups present difficult problems in disease control in measles epidemics. Two outbreaks are described, 136 cases in a college for Christian Scientists, and 51 cases associated with a camp attended by Christian Scientists.

Control measures at the college included immunization and quarantine. An alternative strategy at the camp consisted of dispersal of exposed persons from the camp and their being quarantined in their home States. Three deaths (case-fatality ratio = 2.2 percent) were reported at the college; no serious complications were reported from the camp-associated epidemic. No transmission into the general community occurred in either epidemic.

Public health officials are encouraged to be aware of the legal rights and obligations of religiously exempt groups so that outbreaks in these groups can be effectively controlled, even if standard immunization strategies are not possible. Early reporting and rapid case identification, investigation, and quarantine or vaccination procedures by public health workers are necessary for disease control in these settings.

BEFORE MEASLES VACCINE was licensed in 1963, about half a million cases of measles (rubeola) were reported annually in the United States, resulting in 400 to 500 measles-associated deaths (1). In 1978, the Centers for Disease Control (CDC) announced the goal of eliminating measles in this country.

Components of the Measles Elimination Program include attaining and maintaining high levels of immunity, careful surveillance of the disease, and aggressive control of outbreaks (2). The

elimination program has resulted in a more than 70 percent decrease in the number of cases reported since 1978 and a 99 percent decrease from the number reported in the prevaccine era (3).

One of the major means of ensuring high immunization levels is the requirement for the immunization of school children. However, all States except West Virginia and Mississippi allow exemptions to this requirement based on religious beliefs (4). Because persons exempt for religious reasons may not be randomly distributed in the

community, they can become foci for persistent disease following the introduction of measles (5,6). Persons exempt from immunization requirements may be a source of transmission for measles into the general community and can make possible the explosive transmission of disease within confined populations of group members, such as in camps and schools.

Successful strategies for epidemic control in these settings depend on adequate recognition and reporting of communicable diseases by group members, cooperation between school or camp officials and public health workers, and high levels of immunity in the general population. Control measures relying on early reporting of cases and rapid vaccination of susceptible persons are not easily undertaken, and as a result, large outbreaks of measles are possible among exempt persons (7). In addition, some groups, such as Christian Scientists, do not recognize physical illness in a way that would allow standard medical diagnosis; therefore, they might be less likely to note or report early manifestations of infectious diseases to public health officials unless they are aware that the manifestations represent a reportable disease. Christian Science practitioners rely on prayer to resolve illness and are specifically warned against making diagnoses, because this would constitute the practice of medicine without a license (8).

Outbreaks of measles occurred in two groups of Christian Scientists in 1985. These outbreaks resulted in 187 cases, 90 percent of the 1985 measles cases occurring among religiously exempt persons and 6.7 percent of 2,813 total cases reported to CDC in 1985 (3). This report compares control strategies for these outbreaks and makes suggestions for possible actions regarding measles cases in exempt groups.

College Outbreak

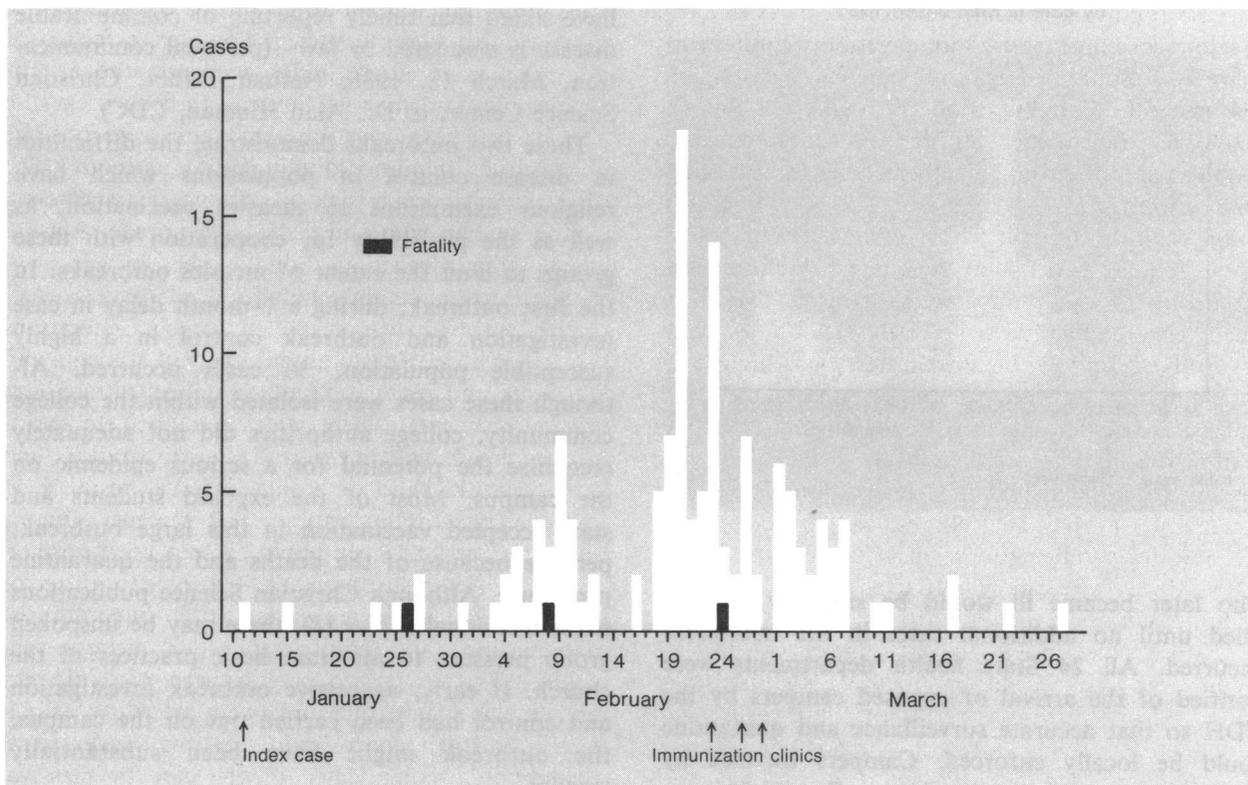
On February 13, 1985, the Illinois Department of Health received a report, through interstate reporting procedures, of a suspected measles case in a Missouri resident who was 1 of 714 students at a college for Christian Scientists in southwest Illinois. By the time the first measles case was reported to the Illinois State Health Department, 30 students, all of whom met CDC's clinical case definition of measles, had been confined to the college's Special Care Area. The CDC definition of measles includes a fever of 101 degrees F. or greater if measured, a generalized rash lasting 3 or more days, and at least one of the following:

cough, coryza, conjunctivitis, or photophobia. The case definition was modified in this outbreak since temperatures were not taken; however, a feeling of warmth was noted. Although access to students for clinical assessment was limited, three acute-phase serum specimens were obtained and were positive for measles immunoglobulin (IgM) antibody. The first student became sick on January 11; she was a young woman who had visited Anchorage, Alaska, during the Christmas holiday season and had returned to the campus January 2.

The outbreak was sustained for six generations (fig. 1), with 125 cases among the 714 students and 121 staff and resident family members (attack rate of 15.0 percent). There were 11 associated cases. Three persons with measles died—two students and a 16-year-old child of a staff member residing on campus (case-fatality ratio = 2.2 percent). One of these persons had been admitted to a local hospital (1 week after rash onset and 4 days after onset of dyspnea) with severe interstitial pneumonitis, hypotension, and adult respiratory distress syndrome. The other two persons who died did not seek medical care but underwent necropsy examination. Both had evidence of interstitial pneumonitis, complicated in one case by massive, Gram-negative bronchopneumonia and in the other by purulent tracheobronchitis and some areas of bronchopneumonia associated with *Staphylococcus* and *Streptococcus*.

Control measures in this outbreak were hampered by late reporting to State health officials and delayed investigation of the early cases. Six cases of suspicious rash were reported to local health authorities by Christian Science nurses at the college in late January. In response to State health department efforts, the college authorities restricted movement on and off campus early in the outbreak, and on-campus immunization clinics eventually were held (fig. 1). Vaccine was administered to 403 students, staff, and family, 135 students were able to prove prior immunization, and 58 students who declined vaccination were voluntarily quarantined on campus for up to 2 weeks after the onset of rash in the last case. An additional 127 persons sought immunization off campus. The 11 associated cases were in Christian Scientists who had been with college students or who were members of student or staff households. These persons essentially remained in their homes for the duration of the rash after they reported their illness to the college. No measles cases were detected in area residents who were not Christian Scientists. New Jersey and Michigan each reported

Figure 1. Measles cases in a Christian Science college in Illinois, by date of rash onset, 1985



one case in persons who had been on campus in February; few susceptible persons were in contact with these case patients, and no related cases were detected.

Camp Outbreak

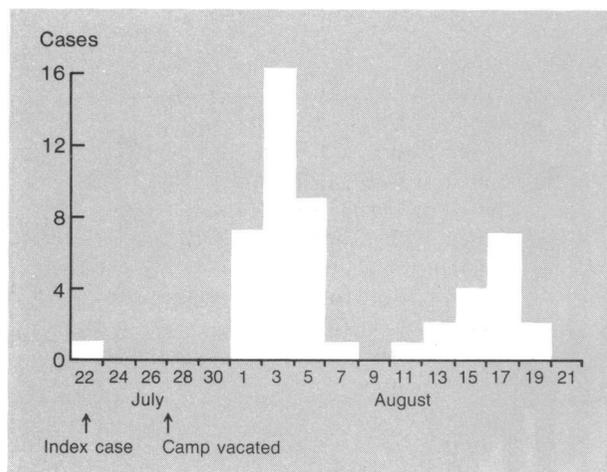
On July 25, 1985, a Colorado camp for Christian Scientists reported to the Colorado Department of Health (CDH) a rash illness in a 17-year-old camper. She had traveled in California during the 2 weeks prior to her arrival at camp. She had prodromal symptoms July 19 and onset of rash July 24. The patient's signs and symptoms met the CDC clinical case definition for measles. At the time of the report, no additional cases had occurred at the camp. However, 110 high-school-age campers and 25 staff at the camp were unimmunized Christian Scientists who had been exposed to the camper with measles. An additional 110 grade-school campers and 25 staff at the same facility had not yet been exposed. The susceptible campers and staff were from 24 different States. No medical records were available for these persons, but few if any were thought to have been immunized against measles.

At the beginning of the investigation, a maxi-

imum of 6 days had elapsed since potential exposure, and campers and staff were not yet considered to be infectious. A second generation of cases was inevitable at this point, but a third generation could be prevented by vaccination or dispersal of the camp population. However, the camp management believed that parents would refuse permission for vaccination if asked, and that parents would not be available by telephone within the time necessary. Because the campers were minors, the camp management did not permit CDH personnel to provide information or vaccination without individual parental permission.

Because quarantine at the camp was thought not to be practical, the camp was closed on July 27, and all campers and staff were dismissed under individual quarantine orders. Strict instructions were given to travel directly home. Parents were given a letter from the CDH advising the vaccination of susceptible household members and instructing parents as to their responsibility for early reporting of illness as well as strict home quarantine of exposed campers. The quarantine order mandated that all exposed campers should be isolated at home until no longer infectious (4 days after onset of rash) or until beyond the maximum incubation period (14 days). Unimmunized siblings of campers

Figure 2. Measles cases in a Christian Science camp in Colorado, by date of rash onset, 1985



who later became ill would be similarly quarantined until no additional cases in the household occurred. All 24 State health departments were notified of the arrival of exposed campers by the CDH so that accurate surveillance and quarantine could be locally enforced. Campers traveled by car, airplane, and chartered bus. Special instructions were given to each person to prevent those who might become ill enroute from exposing the general community. No campers reported onset of rash illness until after arriving home on August 1.

A total of 50 associated cases in two subsequent generations occurred (fig. 2). In the second generation, 31 high school-age campers and 3 counselors developed measles for an overall attack rate in this population of 25.2 percent. In the third generation, 16 cases occurred in unimmunized household contacts of campers. Only one family with a sibling who was exposed to an infected camper accepted immunization (before exposure). No serious complications, hospitalizations, or deaths were reported. No associated cases were reported in the general community.

Discussion

Control of measles in groups exempt from vaccination is dependent on early recognition of cases and understanding of applicable laws by both the public health community and group members. In the case of Christian Scientists, church members and practitioners do not make medical diagnoses. Measles and other illnesses may not be named as such by these persons, and therefore reporting may be incomplete and complicated by the lack of

objective information. However, church officials have stated that timely reporting of communicable disease is mandated by law—(personal communication, March 12, 1986, Nathan Talbot, Christian Science Center, to Dr. Alan Hinman, CDC).

These two outbreaks demonstrate the difficulties in disease control in populations which have religious exemptions to measles vaccination, as well as the possibility for cooperation with these groups to limit the extent of measles outbreaks. In the first outbreak, during a 1-month delay in case investigation and outbreak control in a highly susceptible population, 30 cases occurred. Although these cases were isolated within the college community, college authorities did not adequately recognize the potential for a serious epidemic on the campus. Most of the exposed students and staff accepted vaccination in this large outbreak, perhaps because of the deaths and the quarantine procedure. Although Christian Science publications stress individual choice (8), there may be unspoken group pressure to maintain basic practices of the church. If early, aggressive outbreak investigation and control had been carried out on the campus, the outbreak might have been substantially smaller.

Early reporting of the index case in the second outbreak enabled public health personnel to intervene promptly. Although immunization of exposed persons was recommended, the time required to obtain parental permission and to administer vaccine to those who would accept vaccination made this option less attractive than the quarantine strategy. Many of the campers' parents might have refused to allow their children to be vaccinated, necessitating on-site quarantine for several weeks while all susceptible persons were either vaccinated or infected. If all 270 campers and staff were quarantined at the camp, the attack rate might have been higher, with an increased risk of serious complications and even death. Dispersal depended on high community immunization levels, good surveillance by local health departments, and compliance with quarantine guidelines by the campers' parents.

The degree of opposition to immunization varies among different religious groups. Most religious groups in the United States have no opposition to immunizations, and some groups listed in the adjoining box (Amish and Hutterites) are quite flexible. Christian Scientists generally oppose all medical care because they feel disease reflects a spiritual problem that can be remedied by prayer; individual discretion is allowed, however. National

denominator data for many of these groups are not available from central church offices, and therefore calculations of measles incidence rates for these populations are not generally possible. Although persons with religious exemptions accounted for only 7.2 percent of the total cases in 1985 (3), this is probably greater than their percentage of the U.S. population.

The case fatality ratio for measles in the United States has been less than 0.1 percent for 15 years. Although there is evidence that the case-fatality ratio for measles may be higher for adults compared with younger age groups (9), the occurrence of more than one death in the campus outbreak is notable. The case-fatality ratio for cases in this outbreak is statistically higher than that experienced in the United States from 1974 to 1983 (2.2 percent vs. 0.05 percent; $P < 0.0001$, Poisson distribution (10). Since deaths from measles generally occur at less than 0.1 percent with antibiotic therapy and supportive care, one, two, or all of the deaths at the college might have been prevented if the parents had agreed to timely medical care when complications occurred. Health professionals should educate group members regarding potential complications and should attempt to persuade persons to seek appropriate treatment if complications occur.

Where State immunization laws allow religious exemption from immunization, public health officials must work within the laws. Contingency plans are necessary for the control of outbreaks in exempt populations. Vaccination of susceptibles is the mainstay of measles outbreak control. When most persons who have been exposed, or are at risk of exposure, can be expected to refuse vaccine, a dispersal strategy as used in the camp outbreak, could be effective in limiting the spread of disease. However, this strategy potentially could have created a risk to the general community, since quarantine in the home was unsupervised.

As demonstrated in the two outbreaks, unvaccinated persons have a high probability of remaining susceptible through adolescence and early adulthood because of the low background incidence of measles in this country, where exposure during childhood is no longer likely. For this reason, congregations of unvaccinated persons provide potential for measles outbreaks. In the past, exposure to natural sporadic occurrences of measles in childhood would have prevented mass susceptibility.

In outbreaks, religiously exempt groups have cooperated with immunization clinics, quarantines,

Religious Groups Possibly Opposed to Immunization

Amish
Church of Christ in Christian Union
Church of Christ, Scientist
Church of the First Born
Church of God (several types)
Church of Human Life Sciences
Church of the Lord Jesus Christ
of the Apostolic Faith
Church of Scientology
Disciples of Christ
Divine Science Federation International
Faith Assembly
Hare Krishna
Hutterites
Kripala Yaga Ashram
Mennonites
Netherlands Reform Church
Rosicrucian Fellowship
Worldwide Church of God

SOURCE: Nancy McLaren, "A Study of Immunization Attitudes," presentation to the Center for Health Promotion and Education, CDC, August 25, 1982.

and emergency health procedures, as the Christian Scientists did during these outbreaks. Disease control personnel should attempt to establish working relationships with the leaders of churches, schools, and camps affiliated with groups listed in the box. Both parties would then be aware of the legal requirements for reporting disease and of the advantages to do so early in outbreaks of communicable disease. With accurate and early reporting, disease control personnel are better able to limit outbreaks of disease in exempt persons while providing protection to the general community against spread from these persons.

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HIV Transmission to Female Sexual Partners of HIV Antibody-Positive Hemophiliacs

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Synopsis.....

To study heterosexual transmission of the human immunodeficiency virus (HIV), 21 HIV antibody-positive hemophiliacs and their 21 spouses-sexual partners were evaluated. None belonged to other AIDS risk groups. HIV antibody was detected in four (19 percent) of the female partners. HIV was isolated from peripheral blood lymphocytes of one hemophiliac (4.8 percent), and one female partner (4.8) was antibody-positive. None of the couples engaged in anal intercourse. Compared with HIV antibody-negative female partners, HIV antibody-positive female partners were younger ($P < .05$), had younger hemophiliac partners ($P < .05$), and were likely (although not significantly so) to engage in oral sex ($P = .08$) and to have had more than one sexual partner in the previous 5 years ($P = .08$). Condoms were used all the time by only eight couples (40 percent), and pregnancy occurred in two other couples (9.5 percent), despite prior counseling. These data confirm the low frequency of heterosexual transmission of HIV from HIV antibody-positive hemophiliacs to their female sexual partners and suggest, moreover, that this may be due to the low rate of HIV infectivity in HIV seropositive hemophiliacs exposed to HIV. Further, these data document the need to design more effective educational programs to prevent heterosexual transmission of HIV.

HUMAN IMMUNODEFICIENCY VIRUS (HIV), the etiologic agent of the acquired immunodeficiency syndrome (AIDS), is transmitted by sexual contact, with homosexual transmission accounting for a majority and heterosexual transmission a minority (about 2 percent) of cases of AIDS. Heterosexual transmission has been shown to be bidirectional (1) and, correspondingly, HIV has been isolated in

semen (2), vaginal and cervical fluids (3), and saliva (4).

Most of the persons who have acquired AIDS through heterosexual contact are the female sexual partners of intravenous (IV) drug users (5,6), of bisexual men (6,7) or, rarely, of hemophiliacs who are HIV antibody-positive (8). While some of these women may belong to high-risk groups through